



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street  
San Francisco, Ca. 94105

AR0011

88216512

June 7, 1991

MEMORANDUM

**SUBJECT:** Request for Removal Action Approval at the  
Bluewater Uranium Mine Sites, Prewitt, Navajo Nation,  
New Mexico

**ACTION MEMORANDUM**

CERCLIS ID: PENDING

Site ID: W3

Category of Removal: Time Critical

Nationally Significant or Precedent Setting: Yes

**FROM:** Robert Bornstein *RB*  
On-Scene Coordinator, Emergency Response Section  
(H-8-3)

**TO:** Jeff Zelikson  
Director, Hazardous Waste Management Div. (H-1)

**I. ENDANGERMENT FINDING**

This is to request funding approval for CERCLA funded site activities at the subject site. Conditions presently exist at the site which, if not addressed by implementing the response action documented in this Action Memorandum, could cause the local population and wildlife to be exposed to unsafe external gamma radiation and radionuclides.

**II. SITE CONDITIONS AND BACKGROUND**

**A. SITE DESCRIPTION**

**1. Removal Site Evaluation**

On October 3, 1990, the Emergency Response Section (ERS) was notified by the Agency for Toxic Substance and Disease Registry (ATSDR) of the potential health hazards associated with the uranium mine tailings located at the Brown-Vandever-Nanabah Mines and Navajo-Desiderio Mine, (the Bluewater Uranium Mine Sites). After collecting limited data and conducting several Site visits, ATSDR concluded that the Sites may pose a significant health hazard to the local population because of the presence of radioactive mine tailings, physical hazards, and potential for heavy metal contamination. As a result of their investigation,

ATSDR issued a Public Health Advisory pursuant to Section 104(i)(6)(H) of CERCLA concerning the Sites on November 21, 1990

EPA Region IX ERS was tasked to assess the present radiological and geochemical conditions at the Sites to determine if an emergency response action is warranted. On November 15-16, 1990, ERS conducted a field gamma survey and collected water and soil samples. In addition, a radon flux measurement was performed on tailings at the Desiderio Mine site.

## **2. Physical Location**

The Brown-Vandever-Nanabah and Navajo-Desiderio mine sites are located approximately five miles west of Prewitt, New Mexico (see attached maps, Appendix A). The sites lie within the Ambrosia Lake subdistrict of the Grants Uranium Mining District. The Brown-Vandever-Nanabah site encompasses approximately 155 acres. Half of this area has been disturbed and scared as a result of uranium mining. The Navajo-Desiderio site covers approximately 130 acres, with nearly 60 acres disturbed by mining activities.

The sites are located on four Indian Allotments and one parcel of Federal land which is administered by the Bureau of Indian Affairs. The mines were operated periodically from 1952-1970 by several mining firms.

The uranium ore is primarily calcium carnoite,  $\text{CaO} \cdot 2\text{UO}_3 \cdot \text{V}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ , which disseminates through the Jurassic Todilto limestone. Operations at both mine sites consisted of both open pits and underground mines. Open pit mining was conducted predominantly with large front end loaders and haul trucks. The overburden, consisting of topsoil, alluvium, shale and sandstone was blasted, removed and placed in waste piles. Underground mining was conducted by driving adits to the ore zones within the limestone deposit. Ventilation holes and adits are present at both sites. It is estimated by the Navajo Nation that 25,000 tons of uranium ore was removed from these sites. Mined ore which failed to contain significant quantities of uranium were discarded at the mine sites; and no formal reclamation program was undertaken after mining operations ceased.

Because of the dry climate and lack of chemical weathering, these tailing piles remain exposed and the landscape remains scared.

## **3. Site Characteristics**

Several families live and work on both sites. Approximately forty people, including children, live at the Brown-Vandever-Nanabah site and approximately fifty people live at the Desiderio site. Presently, the land is primarily utilized for grazing of local horses, sheep and goats. Throughout the year, the sheep and goats are allowed to roam freely within the mined areas. At the Brown-Vandever-Nanabah site, several homes are situated within a quarter mile from exposed uranium ore. At the Desiderio

site, several family homes surround the mined area.

Presently there are no restriction preventing the local population or livestock access to the tailing piles or mine shafts. The local population often use the tailing piles as observation posts when herding livestock. Local children are known to play on or around the tailings and near the mine shafts. There is also evidence that many of the home owners utilized mine tailing as foundation materials for their structures.

#### **4. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant.**

On November 15-16, 1990, ERS collected soil, water and air samples at both mine sites. Each mine area was divided into sections and subdivided into sampling stations. Background gamma radiation readings, taken at approximately two miles from the Brown-Vandever-Nanabah site at ground level, were recorded at 11 microroentgens per hour (uR/hr). On Site, readings at ground level ranged from 13 uR/hr at the home sites to 1250 uR/hr within stripped mine pits and 10 uR/hr to 650 uR/hr at waist levels, respectively. Overall, ground level gamma radiation readings within the scared mined areas were recorded to be above 300 uR/hr and waist level readings above 200 uR/hr. At the Desiderio site, the net radiation levels ranged from background to over 350 uR/hr at waist level and over 850 uR/hr on ground contact. Waist level measurements are indictative of human exposure levels and contact measurements suggest the emission rate of the radioactive materials.

Soil samples collected and analyzed for both radium (Ra-226/228) and uranium isotopes (U-233/234/235/238) showed that there were high levels of these radionuclides present within the surface soils. The maximum levels of radioisotopes detected within the top 15 centimeters at the Brown-Vandever-Nanabah site for radium was in excess of 260 picocuries per gram of soil (pCi/g) and for uranium, the maximum level exceeded 390 pCi/g. Similar concentrations of radionuclides were detected at the Desiderio site.

Radon (Rn-222) flux measurements from waste piles were also measured at several stations within the Desiderio mine site. These results revealed that the maximum emission rate of radon was 67 pCi per square meter per second.

No elevated heavy metal concentrations were detected during the November assessment. In addition, potable water samples obtained from taps at both sites indicated that the amount of detected radionuclides were below the Primary Drinking Water Standards.

ATSDR, after review of the data collected by ERS, has concluded (4/22/91 Health Consultation) that the radiation exposure levels at the mine sites poses a severe radiological health hazard to individuals that frequently spend time on the tailings. ATSDR concluded that individuals that frequently work, play or

cross the tailing piles may receive a yearly external radiation exposure of over 100 millirem per year (mrem/yr). The National Council on Radiation Protection and Measurements (NCRP) recommends that continuous or frequent annual external radiation exposure to a population should not exceed 100 millirem per year (mrem/yr) above natural background (cosmic rays, alpha, beta and gamma sources). Population exposed to larger doses could be subjected to an increase cancer rate greater than 1 in 10,000. Both EPA's Office of Air and Radiation and the Department of Energy support the NCRP recommendations.

Several promulgated standards for radioactive material were found to be exceeded by ERS. Soil sampling data indicated that the levels of radium-226 in the top 15 cm of soils exceeds the regulatory limits established in 40 CFR 192. In addition, the radon-222 emission rates exceed the guidelines of 20 pCi per square meter per second outlined in 40 CFR 192.

The radionulides present within the soil are "hazardous substances" as defined in Section 101(14) of CERCLA, 42 U.S.C. Section 9601(14).

The local population are potentially being exposed to the radiation through the following pathways:

- \* Inhalation of radon daughters (decay isotopes);
- \* Direct exposure to elevated gamma radiation;
- \* Inhalation and ingestion of airborne radioactive particles, including alpha emitters.
- \* Ingestion of contaminated meat

## **5. NPL Status**

The two mine sites are not currently on the National Priority List. As a result of the Health Advisory, the Navajo Superfund Office, with assistance from EPA Region IX Site Evaluation Section, is presently reviewing the sites using the Hazard Ranking Scoring model.

## **6. Maps, Pictures and Other Graphic Representations**

Appendix A contains a map of the location of the Sites and a copy of the ATSDR Health Advisory and Health Consultation.

## **B. OTHER ACTIONS TO DATE**

### **1. Previous Actions**

As discussed, the two sites were initially referred to EPA ERS by ATSDR in October of 1990. At that time, ATSDR was preparing to issue a Public Health Advisory. EPA ERS was tasked to complete a preliminary investigation at the Sites to determine if an emergency removal action was warranted.

In order to prepare for this investigation, ERS consulted with the Office of Air and Radiation Region IX and Las Vegas

laboratory, Navajo Superfund Program, ATSDR, and the Indian Health Services. A site specific sampling plan was drafted and reviewed by the various interagency representatives.

On November 15-16, ERS, accompanied by members of the Office of Air and Radiation-Las Vegas Laboratory, EPA's Technical Assistance Team (TAT) contractor, Ecology and Environment, and members of the Navajo Superfund Program conducted an extensive gamma radiation and radionuclide assessment.

Soil, water and air samples were collected during the assessment and analyzed by Eberline Laboratory in Albuquerque, New Mexico. The data was received by EPA ERS in January of 1991.

To assist ERS Region IX in interpreting the results of the radiological survey, copies of the assessment data were forwarded to Bill Nelson, Region IX ATSDR Coordinator, Richard Guimond, Director of the Office of Air and Radiation, and Stephen Luftig, Director of the Environmental Response Division. ERS requested assistance in determining if the sites posed an acute (need to do a removal action) or a chronic (remedial action more appropriate) health risk.

In addition to reviewing the data, ERS began to research and investigate the historical records of the mine sites in order to determine potential responsible parties.

ERS notified William Allen, Regional Environmental Assistant for the Department of Interior about the sites and forwarded copies of the assessment data to the Bureau of Indian Affairs, Bureau of Land Management, and Indian Health Service. To acquire site specific lease information, a CERCLA 104E letter was issued to the Bureau of Indian Affairs, Navajo Office. In addition, a copy of the assessment data was forwarded to the Department of Energy, Grand Junction, Colorado.

On April 8, 1991 members of the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Office of Surface Mining, Indian Health Service (IHS) and the Navajo Nation met to discuss the sites. The various representatives provided background on the sites and their activities to date. In addition, potential response actions to reduce the radiological hazards were discussed including mine reclamation activities.

## **2. Current Actions**

On April 22, 1991, ERS received ATSDR's Health Consultation concerning the assessment data. ATSDR concluded the following:

- \* radiation exposure at these sites could result in adverse health effects depending on the amount of time spent in radioactively contaminated areas. The residential areas appear to be relatively safe; whereas, if much time is spent in areas containing the waste piles, an imminent health problem could surface.

- \* Radionuclide concentrations within the top soil and radon gas emissions at the sites exceed the promulgated standards.
- \* Heavy metals do not pose a health hazard to the residents as initially believed in the Public Health Advisory

ATSDR recommended that additional radiological data be collected at the sites to further assess radon gas emissions, livestock and biota uptake. In addition, the Agency recommended that appropriate measures be immediately undertaken to effectively restrict site access to the local population or reduce the amount of radiological emissions.

On April 15, 1991, the Office of Air and Radiation responded to ERS's request for technical assistance in interpreting the assessment data. Based on the data and information gathered during the assessment, OAR determined that a significant risk may be posed at least one of the sites. However, OAR was not able to conclude without additional data whether the sites pose an acute or chronic threat. OAR recommended that additional data be collected to further assess the radiological hazards. OAR has directed its Las Vegas Laboratory to draft a sampling and data analysis workplan for assessing releases of radionuclides into pathways not addressed during ERS's assessment. The Las Vegas laboratory plans to assess the amount of radon and gamma-ray exposure in homes, radon emanating from mine vents, and radionuclides entering the food chain.

Considering ATSDR's and EPA's concerns, and the length of time that it could take EPA to determine which authority to use to address the conditions at the sites, ERS has decided that the most prudent course of action is to pursue a response action at the sites which would address the most significant radiological hazards. Once this "hot spot control" action is complete, EPA could then continue to investigate and study the sites to assess if additional actions are required.

### **C. STATE AND LOCAL AUTHORITIES' ROLES**

#### **1. State and Local Actions to Date**

The Navajo Superfund Program has been actively investigating both sites since 1989. As part of the pre-remedial process authorized under CERCLA, the Navajo Superfund Program has conducted Preliminary Assessment (PA) reports for both sites in 1990. After review of the PA reports, the Navajo Superfund Program referred the sites to EPA Region VI Site Evaluation Section.

EPA Region VI Site Evaluation Section recommended high priority Screening Site Inspections (SSIs) in August and September.

ber of 1990. In October, 1990, under a new Interagency Agreement, EPA Region IX became the lead agency overseeing the Navajo Nation.

The Navajo Superfund Program assisted ERS in conducting its assessment in November of 1990. The Navajo Superfund Program reviewed and commented on ERS's work and sampling plans. During the assessment, representatives of the Navajo Superfund Program accompanied ERS in the field and helped communicate with the local population.

In addition to assisting ERS with its investigation, the Navajo Superfund Program has conducted several independent studies at the sites. In November of 1990, the Navajo Superfund Program conducted a limited home radon gas study. The data obtained revealed that radon gas within homes at the sites does not appear to be a problem. However, samples collected from carbon canisters placed near mine vents contained extremely high radon concentrations.

## **2. Potential for Continued State/local Responses**

The Navajo Superfund Program is continuing its investigation at the sites. In April of 1991, the Navajo Superfund Program completed an Air Pathway Risk Assessment report for the Brown-Vandaver-Nanabah Mines and determined that the sites posed an increase cancer risk from particulate dispersion.

The Navajo Superfund Program has stated that it will continue to assist EPA in conducting community relations and radiological investigations. However, the Navajo Superfund Program does not pose the resources or finances to perform a response action at the sites.

## **III. Threat to Public Health or Welfare or the Environment**

### **A. Threats to Public Health or Welfare**

Pursuant to Section 300.415(b)(2) of the National Contingency Plan (NCP) the following conditions necessary for initiating a removal action exist:

**1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, food chain** -- Without immediate action, the local population may be exposed to dangerous doses of gamma radiation and elevated concentrations of radionuclides.

Constant or frequent exposure to elevated gamma radiation is known to cause cancer, life span shortening and cataracts. The inhalation of radionuclides exposes internal organs to damaging alpha particles. Uranium and several of its decay daughters are alpha radiation emitters. Once ingested, the alpha particle is trapped within the body and can cause severe organ damage and genetic defects. Radiation is a known carcinogen, mutagen and teratogen.

2. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate -- Elevated concentrations of radionuclides exist within the soils present at the mine sites. As a result of frequent high winds, these contaminants are being dispersed and migrating.

3. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released -- Although the area is relatively dry, the Bluewater District is often subjected to severe thunderstorms and flash flooding. As a result, the mine tailings are slowly being broken down and transported both by alluvial and fluvial forces.

4. Availability of other appropriate Federal or State response mechanisms to respond to the release-- The Navajo Superfund Program has informed EPA that the cost to stabilize the sites exceeds their response capability.

#### **B. THREATS TO THE ENVIRONMENT**

The high emissions of gamma radiation being emitted from the tailing piles may adversely effect the local biota and wildlife. As stated, the land is primarily utilized as grazing grounds for local sheep and goat herds. It is probable that the radionuclides are entering into the local food chain as the livestock ingests the contaminated biota.

#### **IV. ENDANGERMENT DETERMINATION**

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

#### **V. PROPOSED ACTIONS AND ESTIMATED COSTS**

##### **A. PROPOSED ACTIONS**

##### **1. Planned Action**

To reduce the immediate potential radiological hazards associated with the two mine sites, ERS proposes to conduct the following response action:

##### Phase 1

For areas with frequent public and grazing use, grade and apply earth cover to areas emitting gamma radiation greater than 150 uR/hr above background;

##### Phase 2

Fill, seal and cap mine adits, inclines and ventilation shafts to reduce radon gas emissions;

##### Phase 3

For areas with limited public use, post signs warning of radiological hazards in English, Spanish, and



## Navajo.

A guideline of 165 uR/hr (150 uR/hr above background) was selected using the following standard and assumptions:

### Standard

- \* The National Council on Radiation Protection recommends that the continuous or frequent annual radiation exposure from all sources to a population should not exceed 100 mrem/y; the limit of 500 mrem/yr should be applied for an infrequent (short-term) annual exposure. To ensure that the population does not exceed the 500 mrem/yr limit for all sources, the population should not be exposed to over 100 mrem/yr of excess gamma radiation. With gamma radiation, 1 rem is approximately equal to 1 R .

### Assumptions

- \* ERS assumes that the average population spends 2 hrs a day within the affected zones for approximately 300 days out of the year. Natural background is estimated to be approximately 15 uR/hr.
- \* If exposed to an area emitting 165 uR/hr for the total time spent within the affected areas, the population would receive the following gamma radiation exposure:  
 $165 \text{ uR/hr} - 15 \text{ uR/hr} = 150 \text{ uR/hr above background}$   
 $150 \text{ uR/hr} * 2 \text{ hr} * 300 \text{ per year} = 90,000 \text{ uR/yr excess exposure}$

Therefore, the population would be exposed to approximately 90 mrem/yr excess gamma radiation.

Levels below 165 uR/hr including background are considered to be within the acceptable yearly exposure range and do not warrant a removal action.

Since, at this time, EPA does not have any set promulgated radiological action levels for conducting removal actions, ERS believes this calculation will be effective in mitigating any immediate radiological hazards present at these sites. However, this method of selecting "hot zones" may not necessarily be used to select future radiological areas on these sites or future similar sites.

### Phase 1 Activities

ERS has estimated that a total of 25 acres of mine tailings, will require covering at the Brown-Vandever-Nanabah location and approximately 5 acres will need to be covered at the Desiderio site. A more thorough and complete gamma survey will be conducted at the two mine sites to further define and identify areas exceeding 165 uR/hr. The earth cover will include two layers; 1 one foot layer composed of low porosity shale or mud, and the other, composed of topsoil. This cover specification was selected using the Nuclear Regulatory radon attenuation model and should adequately reduce the amount of both radon and gamma emissions.

The covering operation will employ the use of several large earth moving tractors and equipment. ERS estimates that three D-9 tractors, equipped with earth rippers, two large graders, a large sheep foot compactor, several large earth scrapers and water trucks will be required. The cover material, clay and topsoil, will be removed and transported to the sites from neighboring Bureau of Land Management land. Finally, after the cover is applied, the treated areas will be hydroseeded to control erosion and rain run-off.

ERS plans to work closely and consult the Bureau of Land Management, the Bureau of Indian Affairs and Office of Surface Mining in coordinating and implementing phase 1 activities.

### Phase 2 Activities

Phase two operations will consist of backfilling and sealing open mine adits, ventilation shafts and mine shafts to reduce the emission of radon gas. Ventilation shafts will be backfilled using gravel and then plugged with a 2-5 foot thick layer of concrete. ERS has estimated that 100 to 200 yards of gravel would be required to fill each ventilation shaft. Mine adits and openings will be filled with earth fill and plugged with concrete. ERS has identified two mine ventilation shafts, one adit, and one vertical mine shaft located on the Brown-Vandever-Nanabah site and two adits located at the Desiderio site.

### Phase 3 Activities

Phase 3 would consist of erecting warning signs around the steep tailing piles which are not frequently visited by the local population. The warning signs will be in English, Spanish and Navajo.

## **2. Contribution to remedial performance**

The removal actions proposed in this Action Memorandum will alleviate all the potential immediate hazards. Once this "hot spot control" response action is completed, additional studies will be undertaken to determine if additional removal or remedial actions are warranted. ERS believes that the proposed actions will not adversely impact but enhance any future remedial activities.

## **3. Description of alternative technologies**

ERS is not planning to utilize any alternative technologies during this response action. Activities planned for this removal action are considered to be the most effective and best available technologies in alleviating the identified hazards.

**4. Applicable or relevant and appropriate requirements  
(ARARS)**

Federal ARARS -- Toxic Substance Control Act  
Resource Conservation and Recovery Act  
Clean Air Act  
Surface, Exploration, Mining and  
Reclamation of Lands (25 CFR Part 216)  
Uranium Mill Tailings Radiation Control Act

Navajo Nation ARARS -- None identified at this time

**B. ESTIMATED COSTS**

Appendix B contains a cost break down generated by the Removal Cost Management System. It is estimated that the removal action will cost \$629,770.00. Of this, an estimated \$381,845 comes from Regional Allowances. This project estimation includes a 15% Extramural Contingency factor and a 10% Project Contingency factor. This cost projection includes use of Davis-Bacon wage provisions.

ERS estimates that it will take approximately three weeks to complete site work.

**VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN**

If immediate action is not taken at the Site, the local population will continue to be exposed to potentially hazardous yearly doses of gamma radiation and radionuclides. It is unlikely that the remedial program could clean-up the sites within the upcoming year.

**VII. OUTSTANDING POLICY ISSUES**

This removal action is considered to be nationally significant. Pursuant to OSWER Directive 9360.0-19, removal actions involving mining sites, radiation sites and those occurring on tribal lands are subjected to EPA Headquarters concurrence. Therefore, this action memo will be routed to Headquarters for concurrence.

**VIII. ENFORCEMENT**


See Appendix C

**IX. RECOMMENDATION**

This decision document represents the selected removal action for the Bluewater Uranium Mine Sites, Navajo Nation, New Mexico in accordance with CERCLA, as amended by SARA, and, is not inconsistent with, the National Contingency Plan. This decision is based on the administrative record for the site.

The total project ceiling is estimated to be \$629,770.00.

Of this, an estimated \$381,845.00 comes from the Regional Removal Allowance. This includes both a 15% Extramural Contingency and 10% Project Contingency factor. Because conditions at the site meet the NCP section 300.415(b)(2) criteria for removal, I recommend your approval of the proposed removal action.

  
Approval Signature

6-13-91  
Date

Disapproval Signature

Date